Dementia as Detected on the Clock Drawing Test in Older Women Diagnosed with Breast Cancer

Madison E. Perry, Senior BSN student

The Ohio State University

College of Nursing

1585 Neil Avenue

Columbus Ohio

43220

perry.1909@osu.edu

Abstract

Background/Significance: Dementia is a leading cause of dependence and a common comorbidity in older women who are also diagnosed with breast cancer. Many older women with dementia die within six months of a cancer diagnosis. This project is significant in that many older breast cancer patients are also diagnosed with dementia, which can impact the diagnosis and treatment of the malignancy. **Purpose:** The purpose of this research is to describe the incidence, demographic characteristics and types of cognitive deficits in older breast cancer patients as detected by administering the clock-drawing test (CDT). The **Theoretical framework** used for the research is the Health Promotion Model, because many older patients realize they are having cognitive changes and compensate in order to maintain independence as long as possible**. Methods**: This prospective, descriptive study included women aged 69 years and over with a diagnosis of breast cancer. Any stage of breast cancer and type of treatment were included. The Clock Drawing test (CDT) **Results**: The mean age (n=42) was 78 years. 25 (59.5%) were diagnosed with infiltrating ductal carcinoma with 11% being metastatic. 71.4% (30) patients scored abnormal on the clock drawing test. 22 (52.4%) had spatial/planning deficits and 10 (23.8%) exhibited size difficulties. Six (6) people (14.3%) showed conceptual deficits and five (5) people were found to have perseveration deficits (11.9%). Nine (21.4%) participants were found to have two or more abnormalities in the categories. **Conclusion**: Dementia screening should be part of the comprehensive physical assessment of the older person diagnosed with cancer due to the amount of patients who screen positive for dementia using the CDT.

Chapter 1

The World Health Organization (WHO) states that approximately 47.5 million people worldwide are affected with dementia, and 7.7 million new cases are recognized annually (World Health Organization, 2015). The prevalence of dementia has increased over recent years, which may be associated with the increase in the numbers of people aged 65 years and over in the United States (Rocca et al., 2011).

According to the SEER data, three out of 100 women over the age of 60 years will develop breast cancer over the course of ten years (National Cancer Institute, 2014). Breast cancer is commonly diagnosed in women aged 55-64 years and the median age of diagnosis is 61 years (National Cancer Institute, 2014). In patients aged 68 years and over, 7.4% of breast cancer patients had a preexisting diagnosis of dementia, especially prevalent in people who were black, unmarried, impoverished, less educated and with multiple comorbities (Raji, Kuo, Freeman, & Goodwin, 2008). Some older women develop dementia after diagnosis and treatment of breast cancer (Mandelblatt et al., 2014). It is important to recognize and diagnose dementia in older breast cancer patients because there is an increased risk for mortality when a woman has both breast cancer and dementia. Approximately, 33.3% of older breast cancer patients with dementia will die within six months of a cancer diagnosis as compared to 8.5% without a diagnosis of dementia (Raji et al., 2008). Many older women diagnosed with breast cancer currently, will experience a diagnosis of dementia.

Purpose and Significance

The purpose of this research is to describe the incidence, demographic characteristics and types of cognitive deficits in older breast cancer patients as detected by administering the clock-drawing test (CDT). This project is significant in that millions of cases of dementia and breast

cancer are diagnosed annually around the world and in the United States (World Health Organization, 2015). It is important to illuminate the coexistence of dementia in older breast cancer patients so that early detection can help with planning and management of cognitive decline, and with decisions regarding cancer treatment.

Specific Aims

1. Describe the demographic characteristics of the older women diagnosed with breast cancer who underwent cognitive screening.
2. Describe the incidence of positive cognitive screening using the clock-drawing test in older breast cancer patients.
3. Characterize cognitive abnormalities by organizing groups of similar clock drawings.

Theoretical Framework

The Health Promotion Model (Pender, Murdaugh, & Parsons, 2011) defines health as an ever-changing state as compared to the absence of disease and is the patient's level of well-being. The Health Promotion Model (HPM) is the framework for this research in that many people may realize that they are having cognitive limitations. Often patients can compensate and maintain independence until dementia advances to a level that memory is overtly impaired. Cognition is one element of health and many can maintain a sense of "healthy" despite a diagnosis of breast cancer and early dementia. Health is dynamic, especially with aging, and the HPM contents that with managed comorbid conditions, people can lead an independent life (Pender et al., 2011).

Definition of Dementia

The Centers for Disease Control (CDC) defines dementia as a term for a group of cognitive disorders that consist of memory impairment, behavioral disabilities and disturbances of executive function (Centers for Disease Control, 2015). Dementia serves as a general term

relating to the chronic irreversible damage caused to the cognitive functioning and memory impairment (Jablonski, 2013). Dementia is a non-reversible disease effecting cognitive ability and is considered a leading health problem in the United States (Iadecola, 2013).

To diagnose dementia, a decline in mentation must be appreciated (The American Psychological Assocaition, 2016). In addition to mental status changes, behavioral changes may also occur such as agitation, aggression and anxiety. Currently, there are no known clinical markers to identify a diagnosis of dementia (Noe et al., 2004), however there are predictive features. Lower levels of education (Sharp & Gatz, 2011), advancing age (Iadecola, 2013), the presence of rosacea (Egeberg, Hansen, Gislason, & Thyssen, 2016), robust alcohol consumption, heavy smoking and diabetes are risk factors for dementia (Yang et al., 2016).

The American Psychiatric Association, the National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association suggestion that diagnostic criteria for dementia should include a comprehensive history and physical examination, and specialized tests to determine memory and cognitive function limitation. Diagnoses include extent of cognitive impairment and memory disorder, and may accompany diagnoses of depression and anxiety disorders (The American Psychological Assocaition, 2016)

Primary care providers (PCPs) often initially address dementia in terms of screening, diagnosis and referral to neurology for treatment and management considerations (Galvin, Sadowsky, & Nincds, 2012). An algorithm has been established to aid in the diagnosis of dementia which includes assessing the early warning signs, using the appropriate screening tools, assessing the patients behavior changes, psychosis habits, and depression (Galvin et al., 2012).

Often, PCPs diagnose and treat dementia due to lack of resources in many communities for specialized memory disorder care (Darrow, 2015).

It is important to recognize early dementia in order to facilitate a diagnosis, establish treatment and foster behavioral modifications that can support the patient and family (Sadowsky & Galvin, 2012). Early detection allows for planning to help support independence for as long as possible and arrange quality geriatric psychological care (Bradford, Kunik, Schulz, Williams, & Singh, 2009). Treatment with anti-dementia drugs, such as cholinesterase inhibitors, are often used in early diagnosed dementia patients as compared to late disease (Koller, Hua, & Bynum, 2016). However, no treatment intervention has prevented the progression of dementia from a mild cognitive disorder to a diagnosis of dementia (Kelley, 2015).

There are many forms of dementia such as vascular dementias, cognitive impairment, Lewy body dementia and Alzheimer's disease (Alzheimer's Assocaition, 2016a). According to Medicare, Alzheimer's disease (AD) is the most prevalent dementia (43.5%), then vascular dementia (14.5%), and followed by Lewy body dementia (4.5%) (Goodman et al., 2016). Depending on the type of dementia, various behaviors may be more evident. Word finding, facial recognition, and impaired reasoning and decision making are all associated with a diagnosis of AD (Alzheimer's Assocaition, 2016b). Lewy body dementia may exhibit with Parkinsonian signs and hallucinations (Jablonski, 2013). Vascular dementia may present with general gait alterations and problems with executive functioning (Davis, Hendrix, & Superville, 2011). The specific type of dementia can be evident on diagnostic behaviors and screening instruments.

Impact of Dementia on the Social Support System

All types of dementia have a large impact on the patient's support system. Caregivers of older patients report a great deal of burden particularly in situations of psychological and

cognitive decline (Borman et al., 2016). The loss of the patient's ability to work and participate in meaningful activity is a difficult transition for many patients and families (Roach & Drummond, 2014). Being the caregiver to a person with dementia, particularly AD, is a highly burdensome and stressful experience and can culminate in decreased quality of life, more comorbidity and loss of work impacting economic condition of the family (Goren, Montgomery, Kahle-Wrobleski, Nakamura, & Ueda, 2016). Caregivers to dementia patients experience 90% higher odds of experiencing frailty when compared to caregivers to non-dementia patients (Dassel & Carr, 2016).

Long term care facility placement decisions are often motivated by moderate dementia and when the demand for continuous care is emergent (Porter et al., 2016). The demand for long term placement for people with dementia is great and costly. Families may have to make sacrifices to afford the high cost of care.

Compound the stressors with a diagnosis of cancer that potentially requires surgery, radiation therapy, chemotherapy and/or hormonal therapy and support persons can be very busy driving to appointments, caregiving, and completing all the tasks that maintain health and independence of the patient. Decisions regarding the extent of cancer treatment for a person with dementia pose considerable discussion among the healthcare team and the patient and family. The NCCN suggests palliative treatment for cancer patients with the comorbidity of dementia who have mental impairment such that they are unable to make personal care decisions (National Comprehensive Cancer Network, 2016). The NCCN recommendations are consistent with current research suggesting that cancer patients who are diagnosed with dementia tend to receive less aggressive cancer treatment (Hopkinson, Milton, King, & Edwards, 2016). Despite the recommendations and research, decisions regarding the extent of cancer treatment may not be so

clear and patients and families may struggle with considerations associated with quality versus quantity of life.

Chapter 2

Review of Literature

The following review of literature was obtained using the PubMed database and is focused on specific types of dementia such as Alzheimer's disease, vascular dementia and Lewy body dementia. Dementia in older women with breast cancer will be discussed. The search for the literature began with Refworks and using search options for Online Databases. The key words that were searched were Alzheimer's, Dementia, Lewy Bodies, and Vascular Dementia.

Dementia and Breast Cancer

The risk for developing dementia and breast cancer increases with age (National Cancer Institute, 2014; World Health Organization, 2015). People diagnosed with dementia are more likely to be diagnosed with a later stage breast cancer and have an increased risk of cancer-related death (Raji et al., 2008). For some people, cognitive dysfunction and breast cancer are unrelated comorbid conditions. In older women diagnosed with breast cancer, cognitive impairment may be recognized as the diagnosis of cancer and associated with various nonmalignant comorbidities or dementias more common with aging (diabetes, cardiovascular disease) (Mandelblatt et al., 2014).

Conversely, cognitive limitations in breast cancer may be related to cancer treatment and not necessarily age. In women diagnosed with breast cancer and receiving chemotherapy with a mean age of 53 years, 46% reported self-perceived cognitive changes (Mehnert et al., 2007). In large trials including human and rat models, chemotherapy is related to cognitive impairment (Joly et al., 2015). Cognitive abilities were found to be impaired prior to any treatment for the

malignancy which may be linked to Tumor Necrosis Factor (TNF) which are cytokines in patients affected with breast cancer (Patel et al., 2015).

For breast cancer patients diagnosed with a coexisting dementia not related to chemotherapy treatment, dementia requires a great deal of care and management. Dementia effects cancer screening decisions. For women with mild to moderate dementia, patients continued to undergo mammography. For women with severe dementia, screening was not considered as important (Smyth, 2009). Poorer survival, less screening and cancer treatment and more toxicities when receiving treatment are factors expressed in a systematic review of dementia patients diagnosed with cancer (Hopkinson et al., 2016). The National Comprehensive Cancer Network (NCCN) recommends that the ability of a patient to have decision making capacities and to understand the diagnosis and treatment plans and appreciate their situation are important in deciding the type of cancer treatment strategy (National Comprehensive Cancer Network, 2016). For patients who do not have the cognitive ability of decision-making, a proxy decision maker should be engaged in the many complex decisions of cancer treatment.

Types of Dementia

It is important to illustrate the most common types of dementia that may present in addition to a diagnosis of breast cancer While cognitive changes have been known to occur as a result of cancer treatment with chemotherapy (Joly et al., 2015), cognition discussed in this project was most likely a separate diagnosis.

Alzheimer Disease

Alzheimer disease (AD) is the most common form of dementia accounting for approximately 50-60% of the dementia cases (Alzheimer's Assocaition, 2016b). AD is the sixth leading cause of death in the United States (Tejada-Vera, 2013). This age-related, progressive

disease causes the patient memory loss in addition to changes in perception, language and calculation barriers (Noe et al., 2004). Alzheimer's is diagnosed predominantly in people aged 85 years and over (Tejada-Vera, 2013) and symptoms include memory, language, and visual/spatial changes (Alzheimer's Assocaition, 2016b).

According to the National Institute of Aging and the Alzheimer's Association, there are two types of presentations upon which an AD diseases can be made; amnestic changes which are impairments in learning and recall of recently learned material, along with non-amnestic changes which consist of language changes, visuospatial and executive dysfunction (McKhann et al., 2011). Problems with wording finding, facial recognition and impaired reasoning and decision making are all associated with a diagnosis of AD. AD is associated with tissue damage in the hippocampus, which is the center of learning and memory in the brain (Alzheimer's Assocaition, 2016b). Beta-amyloid and tau are proteins that accumulate in the brain due to genetics, environment or lifestyle choices (Hwang et al., 2016). Treatment of AD can help slow the detrition of memory but is not effective in halting or preventing the disease. Cholinesterase inhibitors are effective in mild to moderate AD (Birks, 2006; Birks, Grimley Evans, Iakovidou, Tsolaki, & Holt, 2009).

Vascular Dementia

Vascular dementia, is a name for many vascular disorders that are associated with reduced blood flow to the brain. Risk factors are atrial fibrillation, hypertension, diabetes mellitus, high cholesterol and advancing age (Gorelick et al., 2011). Vascular dementia accounts for 20% of the population living with dementia (Gorelick et al., 2011). When the blood flow is not able to efficiently perfuse the brain, tissue damage can lead to vascular dementia. Onset can be abrupt and can directly follow a myocardial infarction or cerebrovascular accident, or

cognitive deterioration can have a progressive and slow effect after repeated damage to the vascularity of the brain (Jablonski, 2013). Signs and symptoms of vascular dementia include mental deterioration, gait changes and executive dysfunction (Davis et al., 2011). Vascular irregularities such as cerebrovascular disease and other risk factors for vascular damage cause these changes in the brain.

Biomarkers may help diagnose and monitor vascular dementia and can be an effective management strategy (Xiao, Zhao, Kuang, & Guan, 2016). Reducing rates of heart disease and stroke can help decrease vascular dementias (Rocca et al., 2011). Brain images are able to show changes in the white matter of the brain and can distinguish between Alzheimer's dementia and vascular dementia. Patients are often aware of their mental status changes in this type of dementia (Jablonski, 2013).

Lewy Body Dementia

According to the Lewy Body Dementia Association (LBDA), Lewy body dementia (LBD) is a diagnosis that includes Parkinson's dementia and dementia with Lewy body's (Lewy Body Dementia Association, 2016). Dementia develops progressively but can have varying ranges in cognitive impairment (Noe et al., 2004). Protein deposits, called Lewy bodies, join together in the brainstem and brain cortical areas that are composed of the protein alpha-synuclein. For a patient to be diagnosed with LBD, a minimum of two of signs and symptoms must be present: Parkinson's motor signs, alternating attention and concentration spans along with hallucinations (Jablonski, 2013). Extrapyramidal symptoms include the restless leg, shuffling gait, facial distortions and dystonic reactions (Davis et al., 2011; Gomperts, 2016). Cerebrospinal biomarkers and amyloid beta markers may have some predictive ability in

cognitive decline in LBD (Abdelnour et al., 2016). Also, gait difficulties can predict dementia (Beauchet et al., 2016).

There are various differences in memory and mental performance between LBD and Alzheimer's dementia (Gomperts, 2016). Patients with LBD perform worse on visual memory as compared to Alzheimer's disease (Noe et al., 2004). LBD tends to exhibit attentional, visuoperceptive, and visuoconstructive deficits and Parkinson's disease tends to show attentional deficits as compared to Alzheimer's disease which displays a amnesic syndrome (Noe et al., 2004). The importance of nurses knowing the type of dementia allows for the individual to have a more focused plan of care in order to best suit their needs (Jablonski, 2013).

Cognitive Assessment

Screening for cognitive limitations is a critical part of the general assessment of the older person. Interventions exist for people who screen positive for dementia such as physical and cognitive rehabilitation (Tay, Lim, Chan, Ali, & Chong, 2016), medication related treatments (Strohle et al., 2015) and mind-body movement exercises (Hariprasad et al., 2013). Cognitive limitations can be associated with chemotherapy, with the breast cancer diagnosis or as a comorbid condition (Hermelink, 2015). It is important to screen for cognitive limitations in older women with breast cancer and should be included in base line screening prior to cancer treatment (National Comprehensive Cancer Network, 2016). Two examples of cognitive screening are the Mini Mental State Examination (M. Folstein, S. E. Folstein, & P. R. McHugh, 1975) and the Clock Drawing test (Rouleau, Salmon, Butters, Kennedy, & McGuire, 1992).

Chapter 3

Methods

Design

This study was a prospective, descriptive design.

Sample

Women diagnosed with invasive breast cancer, aged 69 years and older were invited to participate. Patients were diagnosed with any stage of cancer and receiving any type of treatment. Participants were able to read and understand the consent form.

Setting

The Stefanie Spielman Comprehensive Breast Center at The Ohio State University (SSCBC) is an outpatient clinical and research facility. Prevention, detection, diagnostic, treatment and reconstructive strategies and management are some of the services offered to people diagnosed with breast cancer. The clinic targeted for this research was the Senior Adult Oncology Clinic, which focuses on older women with breast cancer.

Instrumentation

Clock Drawing Test

Conducting the Clock Drawing Test (CDT) in the clinical setting is to screen for cognitive disabilities as well as dementia (Rouleau et al., 1992). Skills necessary to complete this task include the ability to verbally understand the directions, along with memory and spatial sense. The patient is presented with a pre-drawn circle and asked to draw the face of the clock along with a specific time (Agrell & Dehlin, 2012). Six types of errors have been categorized on the CDT; Size of the clock (<1.5 inches in diameter), graphical difficulties, stimulus-bound

response, conceptual deficit, spatial and/or planning deficit and perseveration (Rouleau et al., 1992).

Graphical difficulties result from imprecise lines, distortion of the clock face, numbers that are difficult to interpret, or hands failing to connect in the middle of the clock. Stimulus-bound response is associated with the patient focusing on one aspect of the directions to draw the clock and is often seen in the time settings that are incorrect. Conceptual deficits are an inability to recall the attributes of a clock. Spatial and/or planning deficits are errors in the layout of the numbers. Perseveration is the continuation or recurrence of activity (presence of more than two hands, numbers that go beyond 12).

Patients with Parkinson's Disease and vascular dementia often exhibit stimulus bound response errors on the CDT which means the drawing of the clock is guided by a single stimulus (when asked to draw 2:10, both hands of the clock may be set at 10 because the patient focused on the number 10) compared to some people with Alzheimer's disease often make conceptually bound errors (Lee, Kim, Choi, & Sohn, 2009).

Patients with Alzheimer's disease create different errors on clock drawings as compared to other types of dementia. When comparing the CDT results for patients with Alzheimer's compared to vascular dementia and Lewy body dementia, no significant differences were noted in performance on the clock drawing. However, a difference between patients with Alzheimer's and Frontotemporal dementia was found, with the later scoring higher (Tan, Herrmann, Mainland, & Shulman, 2015). The clock-drawing test is a component of the Mini-Cog which is another screen for cognitive limitations (Borson, Scanlan, Brush, Vitaliano, & Dokmak, 2000).

Procedures

A convenience sample of new patients who presented to the clinic and over the age of 69 years were invited to participate in the study. The Geriatric Nurse Practitioner (GNP) explained the study and obtained written consent from the patient and the designated caregiver. Health history, cancer diagnoses and treatment information were obtained from the medical record for each of the participants.. The GNP completed the CDT on each patient when they were in the examination room upon initial visit. As part of the CDT, a circle was provided on hardcopy paper for the outline of the clock and the patient was asked to insert the numbers as represented on the face of a clock. Data were collected upon first encounter at the Senior Adult Oncology Program at the SSCBC.

Analysis

To describe the demographic characteristics of the sample, descriptive statistics were used. To describe the incidence of positive cognitive screening, frequencies were calculated. To characterize cognitive abnormalities, the data were organized by groups of similar clock drawings and compared to the scoring system of the Modified Rouleau method (Rouleau et al., 1992).

Chapter IV

Results

To address aim 1, the study included 42 participants with a mean age of 78 years (ranging from 69-93). Most of the patients were diagnosed with infiltrating ductal carcinoma 25 (59.5%), and 11% were metastatic. Approximately 45.2 percent underwent lumpectomy. Many people (45%) reported their health to be better as compared to people their own age (Table 1).

To address aim 2, 30 out of 42 (71.4%) patients scored abnormal on the clock drawing test according to (Rouleau et al., 1992). To describe the abnormalities as indicated in aim 3, 10 (23.8%) people exhibited size difficulties by not drawing the numbers at the edge of the circle provided for the clock drawing. Only one person exhibited graphical difficulties and one person experienced stimulus bound responses. Six (6) people (14.3%) showed conceptual deficits and 22 (52.4%) had spatial/planning deficits. Five (5) people were found to have perseveration deficits (11.9%). Nine (21.4%) participants were found to have two or more abnormalities in the categories. One had both size and perseveration deficits, one had size and conceptual deficits, one had size and spatial deficits, four had spatial/planning limitations (along with size, perseveration and two had conceptual errors), one had preservation and spatial deficits and one person had preservation, conceptual and stimulus bound response.

Discussion

The patients included in this study were breast cancer patients, who were not receiving chemotherapy. Many were taking hormonal therapy as adjuvant or palliative treatment. Some patients were considered frail and could not undergo surgery and were therefore maintained on hormonal therapy. 71.4% of the patients had some abnormality on the clock drawing test, however none of the patients were receiving chemotherapy and therefore did not have chemotherapy related dementia. The number of people who had difficulty drawing an exact clock was high in our study, and higher than the Alzheimer's Association Facts and Figures from 2014 (Alzheimer's Assocaition, 2016a), which is 44% of people aged 75-84 years. It is quite possible that many people were distracted by their oncology medical visit and were not careful drawing the clock during the screening evaluation, which contributed to the high number of abnormal tests. It is important to state that an inexact clock drawn by a patient, may not result in a diagnosis of dementia.

The patient's drawings were categorized into six different groups. The leading error occurred with the placement of the clock numbers, known as a spatial/planning deficit. A possible explanation for this error is that the CDT was performed prior to the patients' oncology appointment; all the stress of the visit may have some correlation with the patients rushing through the test. Patients performing the test also noted that this seemed "silly" and may not have taken this screening seriously. The CDT may have exposed early dementia prior to these patients being diagnosed, despite the fact that the CDT is not sufficient in detecting mild to early cognitive impairment (Ehreke et al., 2009). This data does align with a study that was done in 2009 where patients with AD, VD and PD with dementia recorded a high number of spatial and planning deficits (Lee et al., 2009). For this data, qualitative measures outlined by Rouleau were

used alone, which have been proven to not distinguish between elders with cognitive disorders from those without (Parsey & Schmitter-Edgecombe, 2011; Rouleau et al., 1992). Qualitative categories are helpful to understand the type of dementia, a however scoring mechanism will help differentiate normal cognitive ability from mild impairment (Parsey & Schmitter-Edgecombe, 2011).

Conceptual errors, where the clock drawn is not recognized as a clock, are associated with early dementia; six of the drawings fell into this category (Parsey & Schmitter-Edgecombe, 2011). While people with early dementia versus AD scores vary on the CDT (Babins, Slater, Whitehead, & Chertkow, 2008), older patients with mild cognitive changes fail to score differently than those without cognitive impairments (Parsey & Schmitter-Edgecombe, 2011). Because the research done with CDT in the past typically compares patients with extreme cases of dementia to those without any cognitive impairments, the use of these tools to screen may not hold as much power as once was thought (Hubbard et al., 2008). The CDT does not recognize early dementia (Agrell & Dehlin, 2012) despite the relationship with the Mini-Mental Exam (M. F. Folstein, S. E. Folstein, & P. R. McHugh, 1975).

Concerning the size of the clock, ten patients drew the clock too small (26%). Which was consistent with a similar study, that used the CDT to relate the drawings of those diagnosed with mild cognitive impairment to those with Dementia to those with normal functioning, which resulted in a majority of size errors drawn by those with Alzheimer's (30%) (Parsey & Schmitter-Edgecombe, 2011). In another study, comparing CDT of patients with Alzheimer's Huntington's disease and a control of elderly patients, the clocks that resulted smaller were of those patients diagnosed with Huntington's disease (Rouleau et al., 1992).

Study Limitations

The sample size was small for this initial research project. Some projects reviewed for this research included as little as 60 participants up to 207. For future research, it would be prudent to include more participants. Also, it will be very important to track if patients are being administered aromatase inhibitors which may add to cognitive deficits (Batalo et a. 2011).

Conclusions

Many older patients diagnosed with breast cancer exhibit some abnormality on the CDT. Most abnormalities were spatial/planning difficulties. Dementia screening should be part of the comprehensive physical assessment of the older person diagnosed with cancer.

Table 1. *Participant Characteristics*

Characteristics (n= 37)	Frequency (%) or M (SD)
Age (range from 69-93 years)	78.07
Type of Breast Cancer	
Triple Negative	6 (14.3)
Infiltrating Ductal	25 (59.5)
Carcinoma In-Situ	7 (16.7)
Lobular	3 (7.1)
Bioscopy Pending	1 (2.4)
Metastatic	
Yes	5 (11.9)
No	36 (85.7)
Type of Surgery	
None	5(15.2)
Mastectomy	9 (21.4)
Lumpectomy	19 (45.2)
Self-Reported health status as compared to people their own age	
Not as Good	2 (4.8)
Does not Know	4 (9.5)
As Good	15 (35.7)
Better	19 (45.2)

References

Abdelnour, C., van Steenoven, I., Londos, E., Blanc, F., Auestad, B., Kramberger, M. G., . . . Aarsland, D. (2016). Alzheimer's disease cerebrospinal fluid biomarkers predict cognitive decline in lewy body dementia. *Movement Disord*ers, (31(8), 1203-8.

Agrell, B., & Dehlin, O. (2012). The clock-drawing test. 1998. *Age Ageing, 41 Suppl 3*, iii41-45. 9

Alzheimer's Assocaition. (2016a). Health Care professionals and Alzheimer's. Retrieved 05/24/16, 2016, from http://www.alz.org/health-care-professionals/dementia-diagnosis-diagnostic-tests.asp

Alzheimer's Assocaition. (2016b). What is Alzhemer's Disease. Retrieved June 6, 2016, 2016, from http://www.alz.org/alzheimers_disease_what_is_alzheimers.asp

Babins, L., Slater, M. E., Whitehead, V., & Chertkow, H. (2008). Can an 18-point clock-drawing scoring system predict dementia in elderly individuals with mild cognitive impairment? *J Clinical Experts in Neuropsycholgy, 30*(2), 173-186.

Batalo, M. Nagaiah, G., & Abraham, J. (2011). Cognitive dysfunction in postmenopausal breast cancer patients on aromatase inhibitors. *Expert Reviews in Anticancer Therapies, 11*(8), 1277-82.

Beauchet, O., Annweiler, C., Callisaya, M. L., De Cock, A. M., Helbostad, J. L., Kressig, R. W., . . . Allali, G. (2016). Poor Gait Performance and Prediction of Dementia: Results From a Meta-Analysis. *Journal of the American Medical Diectorsr Associations, 17*(6), 482-490.

Birks, J. (2006). Cholinesterase inhibitors for Alzheimer's disease. *Cochrane Database Syst Rev*(1), CD005593.

Birks, J., Grimley Evans, J., Iakovidou, V., Tsolaki, M., & Holt, F. E. (2009). Rivastigmine for Alzheimer's disease. *Cochrane Database Syst Rev*(2), CD001191.

Borman, P., Gokce-Kutsal, Y., Terzioglu, F., Okumus, M., Ceceli, E., Karahan, S., . . . Sahin, M. (2016). A Multicenter Pilot Study of Burden Among Caregivers of Geriatric Rehabilitation Patients with Neuromusculoskeletal Diseases. *Rehabilitation Nursing*. (AHEAD of PRINT).

Borson, S., Scanlan, J., Brush, M., Vitaliano, P., & Dokmak, A. (2000). The mini-cog: a cognitive vital signs' measure for dementia screening in multi-lingual elderly. *International Journal of Geriatric Psychiatry, 15*(11), 1021-1027.

Bradford, A., Kunik, M. E., Schulz, P., Williams, S. P., & Singh, H. (2009). Missed and delayed diagnosis of dementia in primary care: prevalence and contributing factors. *Alzheimer Disease and Associated Disorders, 23*(4), 306-314.

Centers for Disease Control. (2015). What is Alzheimer's Disease. Retrieved 7/11/16, 2016, from http://www.cdc.gov/aging/aginginfo/alzheimers.htm

Darrow, M. D. (2015). A practical approach to dementia in the outpatient primary care setting. *Primary Care, 42*(2), 195-204.

Dassel, K. B., & Carr, D. C. (2016). Does Dementia Caregiving Accelerate Frailty? Findings From the Health and Retirement Study. *Gerontologist, 56*(3), 444-450.

Davis, N. J., Hendrix, C. C., & Superville, J. G. (2011). Supportive approaches for Alzheimer disease. *Nurse Practitioner, 36*(8), 22-29.

Egeberg, A., Hansen, P. R., Gislason, G. H., & Thyssen, J. P. (2016). Patients with rosacea have increased risk of dementia. *Annals of Neurology*, 79(6), 921-8.

Ehreke, L., Luppa, M., Luck, T., Wiese, B., Weyerer, S., Eifflaender-Gorfer, S., . . . Riedel-Heller, S. G. (2009). Is the clock drawing test appropriate for screening for mild cognitive impairment?--Results of the German study on Ageing, Cognition and Dementia in Primary Care Patients (AgeCoDe). *Dementia and Geriatric Cognitive Disorders, 28*(4), 365-372.

Folstein, M. , Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12*(3), 189-198.

Galvin, J. E., Sadowsky, C. H., & Nincds, Adrda. (2012). Practical guidelines for the recognition and diagnosis of dementia. *Journal of the American Board of Family Medicine, 25*(3), 367-382.

Gomperts, S. N. (2016). Lewy Body Dementias: Dementia With Lewy Bodies and Parkinson Disease Dementia. *Continuum (Minneap Minn), 22*(2 Dementia), 435-463.

Goodman, R. A., Lochner, K. A., Thambisetty, M., Wingo, T., Posner, S. F., & Ling, S. M. (2016). Prevalence of dementia subtypes in U.S. Medicare fee-for-service beneficiaries, 2011-2013. *Alzheimers Dementia, 13(1), 28-37.*.

Gorelick, P. B., Scuteri, A., Black, S. E., Decarli, C., Greenberg, S. M., Iadecola, C., . . . Seshadri, S. (2011). Vascular contributions to cognitive impairment and dementia: a statement for healthcare professionals from the american heart association/american stroke association. *Stroke, 42*(9), 2672-2713.

Goren, A., Montgomery, W., Kahle-Wrobleski, K., Nakamura, T., & Ueda, K. (2016). Impact of caring for persons with Alzheimer's disease or dementia on caregivers' health outcomes: findings from a community based survey in Japan. *BMC Geriatrics, 16*(1), 122.

Hariprasad, V. R., Koparde, V., Sivakumar, P. T., Varambally, S., Thirthalli, J., Varghese, M., . . . Gangadhar, B. N. (2013). Randomized clinical trial of yoga-based intervention in residents from elderly homes: Effects on cognitive function. *Indian Journal of Psychiatry, 55*(Suppl 3), S357-363.

Hermelink, K. (2015). Chemotherapy and Cognitive Function in Breast Cancer Patients: The So-Called Chemo Brain. *Journal of the National Cancer Institute Monograph, 2015*(51), 67-69.

Hopkinson, J. B., Milton, R., King, M., & Edwards, D. (2016). People with dementia: what is known about their experience of cancer treatment and cancer treatment outcomes? A systematic review. *Psychooncology*, 25(10), 1137-1146.

Hubbard, E. J., Santini, V., Blankevoort, C. G., Volkers, K. M., Barrup, M. S., Byerly, L., . . . Stern, R. A. (2008). Clock drawing performance in cognitively normal elderly. *Archieves of Clinical Neuropsycholgy, 23*(3), 295-327.

Hwang, J., Kim, C. M., Jeon, S., Lee, J. M., Hong, Y. J., Roh, J. H., . . . Na, D. L. (2016). Prediction of Alzheimer's disease pathophysiology based on cortical thickness patterns. *Alzheimers Dement (Amst), 2*, 58-67.

Iadecola, C. (2013). The pathobiology of vascular dementia. *Neuron, 80*(4), 844-866.

Jablonski, R. A. (2013). Dementia is not dementia is not dementia. *Journal of Gerontological Nursuring, 39*(1), 3-5.

Joly, F., Giffard, B., Rigal, O., De Ruiter, M. B., Small, B. J., Dubois, M., . . . Castel, H. (2015). Impact of Cancer and Its Treatments on Cognitive Function: Advances in Research From the Paris International Cognition and Cancer Task Force Symposium and Update Since 2012. *Journal of Pain and Symptom Management, 50*(6), 830-841.

Kelley, B. J. (2015). Treatment of Mild Cognitive Impairment. *Current Treatment Options Neurology, 17*(9), 372.

Koller, D., Hua, T., & Bynum, J. P. (2016). Treatment Patterns with Antidementia Drugs in the United States: Medicare Cohort Study. *Journal of the American Geriatrics Society*. 64(8), 1540-8.

Lee, A. Y., Kim, J. S., Choi, B. H., & Sohn, E. H. (2009). Characteristics of clock drawing test (CDT) errors by the dementia type: quantitative and qualitative analyses. *Archieves of Gerontolgy & Geriatrics, 48*(1), 58-60.

Lewy Body Dementia Association. (2016). Learn About LBD. Retrieved June 20, 2016, 2016, from https://www.lbda.org/category/3437/what-is-lbd.htm

Mandelblatt, J. S., Stern, R. A., Luta, G., McGuckin, M., Clapp, J. D., Hurria, A., . . . Ahles, T. (2014). Cognitive impairment in older patients with breast cancer before systemic therapy: is there an interaction between cancer and comorbidity? *Journal of Clinical Oncology, 32*(18), 1909-1918.

McKhann, G. M., Knopman, D. S., Chertkow, H., Hyman, B. T., Jack, C. R., Jr., Kawas, C. H., . . . Phelps, C. H. (2011). The diagnosis of dementia due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimers Dementia, 7*(3), 263-269.

Mehnert, A., Scherwath, A., Schirmer, L., Schleimer, B., Petersen, C., Schulz-Kindermann, F., . . . Koch, U. (2007). The association between neuropsychological impairment, self-perceived cognitive deficits, fatigue and health related quality of life in breast cancer survivors following standard adjuvant versus high-dose chemotherapy. *Patient Education and Counseling, 66*(1), 108-18.

National Cancer Institute. (2014). SEER Cancer Statistics Factsheets: Female Breast Cancer. Retrieved Febuary 12,, 2016, from http://seer.cancer.gov/statfacts/html/breast.html

National Comprehensive Cancer Network. (2016). NCCN Clinical Practice Guidelines in Oncology. Retrieved June 2, 2016, 2016, from https://www.nccn.org/professionals/physician_gls/pdf/senior.pdf

Noe, E., Marder, K., Bell, K. L., Jacobs, D. M., Manly, J. J., & Stern, Y. (2004). Comparison of dementia with Lewy bodies to Alzheimer's disease and Parkinson's disease with dementia. *Movement Disorders, 19*(1), 60-67.

Parsey, C. M., & Schmitter-Edgecombe, M. (2011). Quantitative and qualitative analyses of the clock drawing test in mild cognitive impairment and Alzheimer disease: evaluation of a modified scoring system. *Journal of Geriatric Psychiatry & Neurology, 24*(2), 108-118.

Patel, S. K., Wong, A. L., Wong, F. L., Breen, E. C., Hurria, A., Smith, M., . . . Bhatia, S. (2015). Inflammatory Biomarkers, Comorbidity, and Neurocognition in Women With Newly Diagnosed Breast Cancer. *Journal of the National Cancer Institute, 107*(8).

Pender, N., Murdaugh, C.L., & Parsons, M.A. (2011). *Health promotion in Nursing Practice* (6th ed.). Boston, MA: Pearson.

Porter, C. N., Miller, M. C., Lane, M., Cornman, C., Sarsour, K., & Kahle-Wrobleski, K. (2016). The influence of caregivers and behavioral and psychological symptoms on nursing home placement of persons with Alzheimer's disease: A matched case-control study. *SAGE Open Med, 4*, 2050312116661877.

Raji, M. A., Kuo, Y. F., Freeman, J. L., & Goodwin, J. S. (2008). Effect of a dementia diagnosis on survival of older patients after a diagnosis of breast, colon, or prostate cancer: implications for cancer care. *Archieves of Internal Medicine, 168*(18), 2033-2040.

Roach, P., & Drummond, N. (2014). 'It's nice to have something to do': early-onset dementia and maintaining purposeful activity. *J Psychiatr Ment Health Nurs, 21*(10), 889-895.

Rocca, W. A., Petersen, R. C., Knopman, D. S., Hebert, L. E., Evans, D. A., Hall, K. S., . . . White, L. R. (2011). Trends in the incidence and prevalence of Alzheimer's disease, dementia, and cognitive impairment in the United States. *Alzheimers Dementia, 7*(1), 80-93.

Rouleau, I., Salmon, D. P., Butters, N., Kennedy, C., & McGuire, K. (1992). Quantitative and qualitative analyses of clock drawings in Alzheimer's and Huntington's disease. *Brain Cogn, 18*(1), 70-87.

Sadowsky, C. H., & Galvin, J. E. (2012). Guidelines for the management of cognitive and behavioral problems in dementia. *Journal of the American Board of Family Medicine, 25*(3), 350-366.

Sharp, E. S., & Gatz, M. (2011). Relationship between education and dementia: an updated systematic review. *Alzheimer Disease & Associated Disorders, 25*(4), 289-304.

Smyth, K. A. (2009). Current practices and perspectives on breast cancer screening and treatment in older women with dementia. *Journal of the American Geriatrics Society, 57 Suppl 2*, S272-274.

Strohle, A., Schmidt, D. K., Schultz, F., Fricke, N., Staden, T., Hellweg, R., . . . Rieckmann, N. (2015). Drug and Exercise Treatment of Alzheimer Disease and Mild Cognitive Impairment: A Systematic Review and Meta-Analysis of Effects on Cognition in Randomized Controlled Trials. *American Journal of Geriatric Psychiatry, 23*(12), 1234-1249.

Tan, L. P., Herrmann, N., Mainland, B. J., & Shulman, K. (2015). Can clock drawing differentiate Alzheimer's disease from other dementias? *International Psychogeriatrics, 27*(10), 1649-1660.

Tay, L., Lim, W. S., Chan, M., Ali, N., & Chong, M. S. (2016). A Combined Cognitive Stimulation and Physical Exercise Programme (MINDVital) in Early Dementia: Differential Effects on Single- and Dual-Task Gait Performance. *Gerontology*, 62(6), 604-610.

Tejada-Vera, B. (2013). Mortality from Alzheimer's disease in the United States: data for 2000 and 2010. *NCHS Data Brief* (116), 1-8.

The American Psychological Assocaition. (2016). Guidelines for the Evaluation of Dementia and Age-related Cognitive Change. Retrieved June 29, 2016, 2016, from http://www.apa.org/search.aspx?query=dementia

World Health Organization. (2015). Dementia Factsheet. *Fact Sheets.* from http://www.who.int/mediacentre/factsheets/fs362/en/

Xiao, Y., Zhao, L., Kuang, S. X., & Guan, Z. Z. (2016). Inhibited Expression of alphabeta Nicotinic Acetylcholine Receptor in Blood Leukocytes of Chinese Patients with Vascular Dementia and in Blood Leukocytes as Well as the Hippocampus of Brain from Ischemic Rats. *Cellular Molecular Neurobiology*. 36(8), 1377-1387.

Yang, L., Jin, X., Yan, J., Jin, Y., Yu, W., Wu, H., & Xu, S. (2016). Prevalence of dementia, cognitive status and associated risk factors among elderly of Zhejiang province, China in 2014. *Age Ageing*. 45(5), 708-712.